

EXHIBIT 76

ROBERT A. SIMONS LLC

In re Flint Water Cases

United States District Court – Eastern District of Michigan, Southern Division
Civil Action No. 5:16-cv-10444-JRL-MKM (consolidated)

SUPPLEMENTAL EXPERT REPORT IN SUPPORT OF PLAINTIFFS' MOTION FOR CLASS CERTIFICATION

Section 1: Purpose and Rationale

I, Robert A. Simons, state that the opinions represented herein are offered in the above referenced case to a reasonable degree of scientific probability. Except as specifically identified herein, this supplemental expert report incorporates by reference the discussion, analysis, and conclusions presented in my previous expert report submitted for this case, prepared under date of June 29, 2020.

Subsequent to the submission of my previous expert report for this case, I have undertaken a more detailed exploration and analysis of the available data related to the possible economic effects of the Flint water crisis on businesses located in the city of Flint and particularly upon restaurants, which were not specifically addressed in my initial report. Further analysis was warranted in part due to the connection predicted by economic theory between water quality and restaurant profitability: because restaurants serve water to customers, prepare beverages by combining water with other ingredients, employ water in some food preparation processes (e.g., soups, steaming vegetables, etc.), and use water to wash place settings and utensils, general economic theory would predict that a deterioration in the quality of the city's public water supply would be likely to lead to a reduction in consumer activity at such businesses, due to fear of adverse health effects. It would also be expected that a decrease in consumers' discretionary income (resulting, for instance, from the need to purchase bottled water for home use) would result in less frequent eating out and/or in a substitution of lower-cost restaurant options (i.e., "fast food" and takeout establishments) for more expensive, full-service, "sit-down" restaurants. This substitution may also occur over space (i.e., substituting an eating establishment in the City of Flint for one nearby, outside City boundaries).

Given the logical force of the economic theory regarding the link between restaurant operations and water quality, there was concern that individual restaurant losses may have been "hidden" by the aggregation of data that was employed in our analysis for my previous expert report. For that report, our analysis was designed to identify and focus on NAICS subsectors within which, according to the Reference USA historical database, the majority of Flint businesses had experienced declines in annual sales volume of at least 5% from 2014 to 2018. Particularly within a subsector (such as restaurants) which is subject to internal substitution effects, such a "macro-level" analytical approach can mask individual enterprise losses within the overall performance of the subsector. It is also possible that Reference USA's algorithm for calculating annual sales volume could obscure individual business losses in a subsector in which part-time employment is common.¹ Therefore, in preparing this supplemental expert report, we have chosen

¹ Although Reference USA's algorithm is proprietary, examination of their database suggests that their projection of an enterprise's annual sales volume is directly related to its number of employees. We have been informed in an email communication (David Turner, June 16, 2020) that the Reference USA database reflects total employed

to “dig deeper” in an effort to identify the extent, if any, of such “hidden” losses in the restaurant subsector.

Qualifications. In addition to the experience cited in my previous expert report, I have conducted retail market analyses, including demand for restaurants, for several community development corporations and neighborhood organizations. I have also authored or co-authored the following publications relating to and/or involving analysis of restaurant markets:

- “Site Attributes in Retail Leasing: An Analysis of a Fast Food Restaurant Market,” *The Appraisal Journal*, October 1992, Vol. 60 Issue 4, 521-531; and
- “Development and Issues of Inner-City Retail Niche Markets” (with John Brennan), peer-reviewed chapter in *Megatrends in Retail Property*, John Benjamin, ed., Boston: Kluwer, 1996 (sponsored by the American Real Estate Society and the International Council of Shopping Centers).

Section 2: Executive Summary

Preliminary analysis performed for my previous expert report had suggested that, at least at the “macro” level, the Flint water crisis appeared to have had a relatively minor impact on the revenue streams of most restaurants that were in operation in both 2014 (i.e., prior to the discovery of the water crisis) and 2018 (the last year for which such data were available to us at the individual enterprise level). Accordingly, that previous expert report did not include any calculation of potential damages specific to restaurant members of the proposed commercial Plaintiff subclass for this case. That report did, however, note the potential for “false negatives” among the database analyzed. Furthermore, due to the apparently limited impact of the water crisis on the revenue streams of most “surviving” restaurants, that report never reached the point of considering or analyzing the potential impact of the water crisis on Flint restaurants which may have ceased operations during that four-year period. My more detailed exploration and analysis of the available data, as reported in this supplemental expert report, “fills in” those gaps.

In carrying out my supplemental analysis, I used data from the Reference USA database to compare the experience of restaurants in Flint to those in the remainder of Genesee County for the years from 2014 through 2018, for both (a) “failed” restaurants (i.e., those which were in operation in 2014 but appear to have closed by the end of 2018); and (b) surviving restaurants whose annual sales volume appears to have declined from 2014 to 2018. This analysis found:

- A statistically significant greater percentage of “failed” restaurants in Flint than in the rest of Genesee County, corresponding to 57 additional restaurant closings beyond expected levels in Flint, with business interruption damages aggregating \$15.4 million;
- Little overall difference between Flint and the rest of Genesee County in the percentage of “surviving” businesses whose annual sales volume appears to have declined from 2014 to 2018; and

individuals rather than full-time equivalents. To the degree that a business adjusted to declining sales by reducing employee hours rather than resorting to layoffs, the Reference USA algorithm might thereby overstate annual sales volume.

- 9 such “surviving” restaurants in Flint (i.e., “false negatives” from the analysis performed for my previous expert report) with aggregate lost profit of \$163,000 for the four-year period.

I also applied the same Flint-vs.-Genesee-County comparisons to Reference USA data for the 26 NAICS subsectors analyzed in my previous expert report for this case, over the same 2014-2018 period. This comparison revealed:

- Statistically significant higher failure rates in Flint in the aggregate and for 4 individual subsectors;
- Higher but not statistically significant failure rates in Flint for 12 subsectors; and
- Higher but not statistically significant failure rates outside Flint for 8 subsectors.²

For “surviving” businesses (i.e., those in operation at both the beginning and end of the period from 2014 through 2018) among these 26 NAICS subsectors, the Flint-vs.-Genesee-County comparison revealed:

- A statistically significant higher percentage of enterprises with revenue decline in Flint in the aggregate and for 2 individual subsectors;
- Higher but not statistically significant revenue decline percentages in Flint for 13 subsectors; and
- Higher but not statistically significant revenue decline percentages outside Flint for 3 subsectors.³

Using a decision tree, we adjusted certain previously-calculated damage projections for the 26 NAICS subsectors and the restaurant sector, based upon the combination of economic theory, the Reference USA raw data, and our Flint-vs.-Genesee-County comparison. With these adjustments, we find that economic damages sustained by Flint commercial enterprises as a result of the Flint water crisis, during the period from 2014 through 2018, aggregate at least \$99.7 million (i.e., \$16.5 million in lost profits, \$74.1 million in business interruption damages for closed enterprises, and \$9.1 million in reserve for potential members of the proposed Plaintiff subclass outside these subsectors).

Section 3: Methodology and Findings

In order to identify impacts of the water crisis on Flint restaurants that may have been “hidden” from our previous analysis, we compared enterprise-level data (i.e., as contained in the Reference USA database) for restaurants in Flint to the corresponding data for restaurants in the remainder of Genesee County. This comparison enables us to highlight local differences within the same regional economy. This comparison technique implicitly assumes that Genesee County enterprises located outside the city of Flint can serve, in effect, as a “control group” for evaluating the impact of the Flint water crisis on similar enterprises located in Flint.

In their business database, Reference USA includes a variety of restaurant subtypes (e.g., fast food restaurants, pizza restaurants, takeout restaurants, national sit-down chains, casual “family” restaurants,

² For 2 of these 26 NAICS subsectors, the statistical significance of the difference between Flint and other Genesee County businesses could not be determined, as the formula used to calculate the corresponding z-statistic produced a “0” in the denominator.

³ For 8 of these 26 NAICS subsectors, the statistical significance of the difference between Flint and other Genesee County businesses could not be determined, as the formula used to calculate the corresponding z-statistic produced a “0” in the denominator.

bar-and-grill restaurants, and more “upscale” or “niche” restaurants) in the same 6-digit NAICS code category (722511, “Full-Service Restaurants”). To facilitate more meaningful comparison of these disparate restaurant subtypes, we disaggregated the database by subtype, using internet searches to access descriptions and photos of individual restaurants. For each subtype, we then compared restaurants with Flint addresses to those in Genesee County outside Flint, along two measures:

- The “failure rate” or percentage of restaurants existing in 2014 which do not appear in the Reference USA database for 2018 (i.e., assumed to have closed); and
- The percentage of “surviving” restaurants for which the Reference USA data indicates a decline in annual sales volume from 2014 to 2018.

Restaurant Closures. The results of this analysis provide evidence of a negative impact on restaurant performance within the city of Flint, particularly in terms of apparent restaurant closures (failure rate). When the effects of small sample sizes are mitigated by regrouping the restaurant subtypes into two broader categories (i.e., fast food/pizza/takeout/national chains vs. local sit-down/bar-and-grills/niche), we find a statistically significant higher failure rate for Flint restaurants compared to those in the remainder of Genesee County. The Reference USA database indicates that 101 restaurants in Flint appear to have closed between 2014 and 2018, and that the average age of all Flint restaurants appearing in the database for 2014 was 17 years. Data from the Bureau of Labor Statistics for private businesses in Michigan which began operations in 1997 indicate that 85.4% of such businesses still in operation in 2014 remained in operation during 2018. With 299 Flint restaurants included in the Reference USA database for 2014, we would thus expect 255 to survive through at least 2018; however, the Reference USA database indicates that only 198 of these Flint restaurants remained in operation during 2018, suggesting that there were 57 more restaurant closures in Flint during the period from 2014 through 2018 than would have been expected based on statewide experience. We attribute these 57 excess restaurant closures to the effects of the Flint water crisis. Using the methodology described in my previous expert report for this case, the business interruption damages sustained by this excess failure of 57 restaurants in Flint approximate \$15.4 million.

Lost Profits of Surviving Restaurants. Our more in-depth analysis of restaurant sales volume data confirmed the existence of “false negatives” which were not identified in the analysis performed for my previous expert report for this case. Within the Reference USA restaurant data, which suggests that the great majority of restaurants in Flint and in Genesee County experienced increases in sales volume from 2014 to 2018, we found 9 Flint restaurants for which the Reference USA data reflect decreasing sales volume over that period. Applying conservative published profit margins of 2.5% for sit-down restaurants and 5% for fast food, pizza, and takeout operations,⁴ I project that these 9 Flint restaurants suffered profit losses of \$163,000 in the aggregate over the four-year period. I note that the higher-than-expected failure rate of restaurants in Flint during the 2014-2018 period would have, in effect, freed up consumer discretionary budgets for additional purchases at those restaurants which remained in operation. This

⁴ See, for example, Gabe Flores, “What Is the Average Profit Margin for a Restaurant?”, February 25, 2020 (at <https://www.restaurant365.com/blog/what-is-the-average-profit-margin-for-a-restaurant/>); and Stefon Walters, “The Average Profit Margin for a Restaurant,” August 22, 2019 (at <https://yourbusiness.azcentral.com/average-profit-margin-restaurant-13113.html>).

substitutionary effect would have tended to mitigate revenue losses which otherwise might have been experienced by those surviving restaurants, rendering the results of the analysis of annual sales volume for these restaurants somewhat ambiguous.

Applying the Flint-vs.-Genesee County Comparison to the Other 26 NAICS Subsectors. Having applied this City-County “case-control group” analysis technique to the restaurant subsector, we then applied it to the 26 NAICS subsectors analyzed in my previous expert report for this case. As summarized above, the results are generally supportive of that report’s conclusion that these Flint businesses had sustained negative economic impacts from the Flint water crisis. The comparison reveals that, in the aggregate, the Flint enterprises experienced a higher percentage of business failures (i.e., closures) than those in the remainder of Genesee County during the four-year period from 2014 through 2018, and that the percentage of “surviving” enterprises which suffered a decline in annual sales volume over that period was higher in Flint than in the remainder of the county. These differences were statistically significant at a confidence level of greater than 95%.

At the individual 6-digit NAICS subsector level, with a few exceptions,⁵ due to smaller sample sizes it was generally not possible to obtain statistically significant differences between enterprises in Flint and in the remainder of Genesee County. As noted above, however, even where the differences do not meet commonly-accepted standards for statistical significance, within approximately 60% of these 26 NAICS subsectors Flint enterprises show evidence of experiencing negative economic outcomes at a higher rate than those in the remainder of the county. This pattern lends support to the process by which we identified the 26 NAICS subsectors, as described in my previous expert report.

The results of this comparison analysis, by individual NAICS subsector and in the aggregate, are presented in Table S1.

Conservative Nature of the Comparison Results. There are reasons to believe that the Flint-vs.-Genesee-County comparison technique would produce conservative results. Economies are regional, not local, and extend across municipal boundaries. It is reasonable to assume that Flint residents, prior to the water crisis, would have spent a certain portion of their disposable income at consumer enterprises located outside Flint itself. A reduction in Flint residents’ discretionary income, resulting from the water crisis, would therefore be expected to have a spillover effect on consumer-oriented businesses in neighboring communities as well, thus undermining to some extent those communities’ ability to serve as a “pure” control group for Flint businesses.⁶ Accordingly, to the extent that consumer-oriented businesses in neighboring communities may have also seen their revenues decline due to a reduction in the discretionary income available to Flint residents, the relative degree of the negative impact of the water

⁵ Flint enterprises evidenced statistically significant higher failure rates of barber shops (NAICS 812111) and beauty salons (NAICS 812112) at the 95% confidence level, and of musical instrument and supplies stores (NAICS 451140) and other personal services (NAICS 812990) at the 90% confidence level. Among “surviving” businesses, electronics stores (NAICS 443142) and other personal service enterprises (NAICS 812990) experienced statistically significant higher frequencies of decline in annual sales volume in Flint, at the 90% confidence level.

⁶ Several Genesee County communities (Mt. Morris, Grand Blanc, Swartz Creek, Flushing, and Davison) are located within a few miles of Flint, and one (Burton) is contiguous with most of Flint’s eastern and southern boundary.

crisis on Flint businesses would tend to be obscured in the application of this Flint-vs.-Genesee-County comparison technique.⁷

Application of the Flint/County Comparisons to Damage Calculations. I have used the results of the Flint-vs.-Genesee-County “control” comparisons to adjust in a formulaic manner, using a decision tree, the damage calculations for the 26 NAICS subsectors as contained in my previous expert report for this case, as well as for the restaurant subsector as described above. Because of the economic theory undergirding my previous identification and analysis of the 26 NAICS subsectors, the decision tree calls for no adjustment in circumstances where we find strong evidence of economic damage to Flint businesses in a given subsector (i.e., where the Flint/County comparison shows a greater percentage of businesses which “failed” or lost annual sales volume, or where all “surviving” Flint businesses suffered a reduction in sales volume from 2014 through 2018). For subsectors without such evidence, I have reduced the previously calculated damages by 25% (i.e., an adjustment factor of 0.75).⁸ Thus, I use the Flint/County comparisons to temper, but not overrule, the damages to Flint commercial enterprises revealed by my previous sector analysis and the Reference USA database.

⁷ With particular respect to restaurants, the spillover impact of the water crisis on Flint residents’ spending patterns is likely to have had two opposite effects on restaurants in the remainder of Genesee County. First, a reduction in discretionary income would be expected to cause a reduction in the number and frequency of Flint residents eating out, both inside Flint and in neighboring Genesee County communities. Alongside this effect, however, we would expect to find a substitution effect in which Flint residents would migrate to restaurants in neighboring communities when they choose to eat out, because of their awareness that the water at those restaurants is safer than the water at restaurants in Flint. In terms of their expected impact on restaurant operations, these two effects would work in opposite directions for restaurants outside Flint (i.e., capturing a higher percentage of a smaller volume of restaurant diners), while having an additive effect for restaurants inside Flint (i.e., attracting a smaller percentage of a smaller volume of restaurant diners). To the extent that the Reference USA sales volume algorithm may not be sufficiently sensitive to detect such changes at the margins, the Flint-vs.-Genesee-County comparisons calculated using the Reference USA data will tend to understate the degree to which Genesee County restaurants outperformed their Flint counterparts once the water crisis became known to the public.

⁸ As described in the previous subsection, the reduction in Flint residents’ discretionary income resulting from the water crisis is likely to have had a spillover effect on the revenues of consumer-oriented businesses in neighboring Genesee County communities outside Flint. In light of this confounding effect on some of the Flint-vs.-Genesee-County comparison calculations, and given the force of the economic theory and the logic of the data analysis underlying the determination of NAICS subsectors in Flint likely to have been affected by this reduction in discretionary income (as developed in my previous expert report for this case), it is my evaluation that the previous analysis should weigh more heavily than the Flint-vs.-Genesee-County comparison in the calculation of economic damages sustained by the proposed commercial Plaintiff subclass in this case. In adjusting such damages for this supplemental expert report to take account of the Flint-vs.-Genesee-County comparisons, I have therefore applied a 75%/25% weighting in favor of the results of my previous analysis, as developed from data based on the economic theory. I note that in academic work, 85% is considered to be the minimum level required to maintain statistical significance when evaluating a hypothesis. In applying a 25% discount to the previously determined damages for those NAICS subsectors for which the Flint-vs.-Genesee-County comparison hints that Flint businesses may have outperformed similar businesses in the remainder of the county, I am therefore taking account of the lack of statistical significance in the comparison data for those individual subsectors (which often reflected small sample sizes), while acknowledging the overall statistical significance of those comparisons for the 26 NAICS subsectors and the restaurant subsector in the aggregate. Further work can be done to refine this reduction at the merits stage.

After making these adjustments to the data presented in my previous expert report, and incorporating the business interruption damages and lost profits associated with Flint restaurants as described above, I find that that members of the proposed commercial Plaintiff subclass for this case have sustained economic damages aggregating approximately \$99.7 million as a result of the Flint water crisis, through the end of calendar year 2018. Of this amount, \$16.5 million represents lost profits of enterprises which continued in operation throughout the period from 2014 through 2018; \$74.1 million represents business interruption damages sustained by enterprises which ceased operations during that period; and \$9.1 million represents an assumed 10% holdback for expected additional commercial Plaintiff claims from enterprises not considered within our analyses (i.e., “false negatives”).⁹ The composition of these damages, by each of the 26 NAICS subsectors and the two restaurant groupings, are presented in Table S2.

Section 5: Data Considerations

In the course of our analysis of the Reference USA historical database, we became aware that, on occasion, the same establishment had been classified under different primary 6-digit NAICS codes in different years. Such instances of changing or inconsistent classification create the potential for misinterpreting the status of businesses which operated throughout the period from 2014 through 2018 as either having closed after 2014 (thus being inadvertently treated as a “failed” business) or as having begun their operations after the Flint water crisis was known (thus being inappropriately treated as ineligible for membership in the proposed commercial Plaintiff subclass). We believe, based on our review, that such instances of inconsistent NAICS classification within the Reference USA database are rare and that, in the aggregate, they do not significantly affect the results of our analysis. Furthermore, these two types of misclassification (i.e., inappropriate business “failures” and inappropriate omissions from the proposed Plaintiff subclass) would affect our damage calculations in opposite directions, thus tending to cancel each other out in terms of their effect on the overall scope of our damage calculations for the proposed Plaintiff subclass as a whole.

After completing our analysis, we also became aware of a geographic issue with the potential to affect the Reference USA database. An unincorporated community known locally as “Beecher” is located contiguous to Flint’s northern municipal boundary. This unincorporated community includes parts of three postal ZIP Codes, two of which (48504 and 48505) are associated primarily with Flint. (It is possible that a similar situation could exist in other nearby communities where the Flint city limits border unincorporated portions of neighboring township.¹⁰) It is therefore possible that some businesses with “Flint” addresses (and thus shown in the Reference USA database with Flint as their city) are actually located outside the Flint city limits and would thus receive their water from township sources rather than

⁹ Data analysis for my previous expert report for this case indicated that the proportion of such “false negatives” could be as high as 15%. My choice of a 10% net allowance here reflects the possibility that the Reference USA database may also lead to the inclusion in our damage calculations of a smaller amount of “false positive” businesses.

¹⁰ In fact, a similar issue may have contributed to an initial underappreciation of the severity of the lead poisoning problem resulting from the Flint water crisis; see <https://www.gislounge.com/quirky-geography-zip-codes-obscured-flints-lead-problem/>.

from the Flint water system.¹¹ Such businesses can be identified through mapping on a geographic information system (GIS), and so this particular data challenge can be readily addressed, in a consistent formulaic manner, during the merits phase of this case. It is believed that, in the aggregate, any businesses inappropriately identified in the Reference USA database as being located in Flint would not have a significant effect on the scope of the economic damages to members of the proposed Plaintiff subclass, as reported in this supplemental expert report, given the anticipated small number of such businesses.

Section 6: Summary

To summarize, using the best data currently available to me,¹² and to a reasonable degree of scientific certainty given the resources available, I evaluated commercial business sectors in Flint, Michigan to determine those which may have experienced decreases in sales volume and suffered business interruption damages due to the water crisis which began in 2014. For this supplemental expert report, I performed a similar evaluation of Flint businesses in the restaurant subsector, and I compared the data for all such Flint businesses to those of businesses in the corresponding commercial business sectors in the remainder of Genesee County outside the city of Flint.

I found likely business losses in Flint in 26 six-digit NAICS code subsectors that were vetted by showing declines in sales over time greater than Flint's 3% population decline, and which also showed relative declines in total wage trends (a proxy for sales volume) compared to Saginaw and Grand Rapids. I also found likely business losses within the restaurant subsector, including both business interruption damages for closed restaurants and lost profits for certain restaurants which continue in operation. The most reasonable estimate is that there were an aggregate of \$247 million in lost sales associated with the Flint water problem, with a corresponding \$16.5 million in lost profits among the 549 enterprises that were present for the entire period from April 2014 through the end of 2018. I also estimate losses related to business interruption, including partial lost profit, lost owners' equity, obligations to repay secured debt, and penalties and potential damaged credit of \$74.1 million, among the 472 firms that were open in 2014 but not listed on the Reference USA database in 2018. Allowing a 10% holdback (\$9.1 million) for expected additional commercial claims from enterprises in subsectors not specifically contemplated in my expert reports for this case, the total loss estimates for the proposed commercial Plaintiff subclass in this case are \$99.7 million. These damage calculations make no provision for the time value of money, and

¹¹ Some such businesses made overt efforts to reassure potential patrons that their water did not come from the Flint water system; see Exhibit 2 for an example of one such restaurant. However, media reports indicate that such efforts may have done little to offset the reduction in business resulting from public perception of the severity of the water problem ("Flint water crisis takes toll on city businesses," January 18, 2016, accessed at <https://www.fox2detroit.com/news/flint-water-crisis-takes-toll-on-city-businesses>; "What It's Like to Run a Business During Flint's Water Crisis," January 22, 2016; accessed at <https://www.inc.com/will-yakowicz/flint-water-crisis-local-business-entrepreneurs.html>).

¹² As of the date of this supplemental expert report, I have not yet been provided with gross receipts data from the tax returns of Flint businesses, as requested from the State of Michigan over six months ago. Such data, if provided with individual business ID codes, could readily provide identification of all potential members of the proposed commercial Plaintiff subclass for this case. Even if provided without individual business identification but with the primary 6-digit NAICS code for each business, such data could readily be analyzed in a straightforward, formulaic manner to provide a highly reliable calculation of the scope of aggregate business damages, due to the Flint water crisis, sustained by members of the proposed commercial Plaintiff subclass in this case.

ROBERT A. SIMONS LLC

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I reserve the right to do so during the merits phase of this case. My analysis assumes that all businesses in the Reference USA database with an address identifying “Flint” as the city are, in fact, located within the Flint municipal boundaries. My workplan for the merits phase of this case will include formulaic analysis to confirm that assumption through address mapping against the GIS database of Flint businesses maintained by Plaintiff’s counsel, so as to ensure that our economic damage calculations include only businesses with physical locations within the Flint municipal boundaries. I also plan to update our work with “new” (2017) economic census data and a fresh set of 2019 data from Reference USA. I have conducted this work with a reasonable degree of scientific certainty, and I reserve the right to change my opinion and to supplement this expert report if new information becomes available.

Signed, Beachwood Ohio, October 2, 2020



Robert A. Simons, Ph.D.

Table S1: Comparison of Flint Businesses to Those in the Remainder of Genesee County
(6-Digit NAICS Code Subsectors)

2.5	FLINT							GENESEE COUNTY OUTSIDE FLINT							DIFFERENCE OF PROPORTIONS: FAILURE RATE								DIFFERENCE OF PROPORTIONS: SURVIVORS WHO LOST REVENUE										
	Type	Survivors	Closers	Percent Closed	Survivors Who Lost Revenue	Percent Who Lost Revenue	Lost Annual Revenue	Total Lost Revenue, 2014-2018	Survivors	Closers	Percent Closed	Survivors Who Lost Revenue	Percent Who Lost Revenue	Lost Annual Revenue	Total Lost Revenue, 2014-2018	Z-stat	P1	P2	P	1-P	1/n1	1/n2	Num	Denom	Z-stat	P1	P2	P	1-P	1/n1	1/n2	Num	Denom
26 NAICS Subsectors:																																	
446120 (Cosmetics/Beauty Supplies/Perfu	19	9	32.1%	19	100.0%	\$ 32,492,000	\$ 81,230,000	15	14	48.3%	15	100.0%	\$ 11,761,000	\$ 29,402,500	-1.241	0.321	0.483	0.404	0.596	0.036	0.034	-0.161	0.130	#DIV/0!	1.000	1.000	1.000	0.000	0.053	0.067	0.000	0.000	
446199 (All Other Health/Personal Care St	9	10	52.6%	9	100.0%	\$ 5,078,000	\$ 12,695,000	7	5	41.7%	6	85.7%	\$ 1,579,000	\$ 3,947,500	0.595	0.526	0.417	0.484	0.516	0.053	0.083	0.110	0.184	1.171	1.000	0.857	0.938	0.063	0.111	0.143	0.143	0.122	
524210 (Insurance Agencies & Brokerages	90	100	52.6%	80	88.9%	\$ 13,153,000	\$ 32,882,500	130	157	54.7%	109	83.8%	\$ 15,766,000	\$ 39,415,000	-0.444	0.526	0.547	0.539	0.461	0.005	0.003	-0.021	0.047	1.057	0.889	0.838	0.859	0.141	0.011	0.008	0.050	0.048	
524291 (Claims Adjusting)	4	4	50.0%	3	75.0%	\$ 249,000	\$ 622,500	0	2	100.0%	0	#DIV/0!	\$ -	\$ -	-1.291	0.500	1.000	0.600	0.400	0.125	0.500	-0.500	0.387	#DIV/0!	0.750	#DIV/0!	0.750	0.250	0.250	#DIV/0!	#DIV/0!	#DIV/0!	
524292 (Third-Party Administration–Insur	3	0	0.0%	2	66.7%	\$ 1,327,000	\$ 3,317,500	1	0	0.0%	1	100.0%	\$ 142,000	\$ 355,000	#DIV/0!	0.000	0.000	0.000	1.000	0.333	1.000	0.000	0.000	-0.667	0.667	1.000	0.750	0.250	0.333	1.000	-0.333	0.500	
451120 (Hobby/Toy/Game Stores)	6	5	45.5%	6	100.0%	\$ 1,328,000	\$ 3,320,000	16	12	42.9%	15	93.8%	\$ 610,000	\$ 1,525,000	0.147	0.455	0.429	0.436	0.564	0.091	0.036	0.026	0.176	0.627	1.000	0.938	0.955	0.045	0.167	0.063	0.063	0.100	
451130 (Sewing/Needlework Stores)	1	1	50.0%	1	100.0%	\$ 1,229,000	\$ 3,072,500	8	5	38.5%	6	75.0%	\$ 1,170,000	\$ 2,925,000	0.310	0.500	0.385	0.400	0.600	0.500	0.077	0.115	0.372	0.567	1.000	0.750	0.778	0.222	1.000	0.125	0.250	0.441	
451140 (Musical Instrument & Supplies St	2	5	71.4%	2	100.0%	\$ 645,000	\$ 1,612,500	6	2	25.0%	6	100.0%	\$ 810,000	\$ 2,025,000	1.798	0.714	0.250	0.467	0.533	0.143	0.125	0.464	0.258	#DIV/0!	1.000	1.000	1.000	0.000	0.500	0.167	0.000	0.000	
451211 (Book Stores)	9	9	50.0%	9	100.0%	\$ 2,401,000	\$ 6,002,500	5	6	54.5%	4	80.0%	\$ 177,000	\$ 442,500	-0.238	0.500	0.545	0.517	0.483	0.056	0.091	-0.045	0.191	1.392	1.000	0.800	0.929	0.071	0.111	0.200	0.200	0.144	
711110 (Theater Companies & Dinner The	3	1	25.0%	3	100.0%	\$ 1,417,000	\$ 3,542,500	1	0	0.0%	1	100.0%	\$ 177,000	\$ 442,500	0.559	0.250	0.000	0.200	0.800	0.250	1.000	0.250	0.447	#DIV/0!	1.000	1.000	1.000	0.000	0.333	1.000	0.000	0.000	
711190 (Other Performing Arts Companie	5	7	58.3%	5	100.0%	\$ 2,320,000	\$ 5,800,000	5	5	50.0%	4	80.0%	\$ 951,000	\$ 2,377,500	0.391	0.583	0.500	0.545	0.455	0.083	0.100	0.083	0.213	1.054	1.000	0.800	0.900	0.100	0.200	0.200	0.200	0.190	
711410 (Agents & Managers)	1	0	0.0%	1	100.0%	\$ 293,000	\$ 732,500	0	0	#DIV/0!	0	#DIV/0!	\$ -	\$ -	#DIV/0!	0.000	#DIV/0!	0.000	1.000	1.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.000	#DIV/0!	1.000	1.000	0.000	1.000	#DIV/0!	#DIV/0!	#DIV/0!
711510 (Independent Artists, Writers, Perl	5	16	76.2%	4	80.0%	\$ 1,789,000	\$ 4,472,500	10	15	60.0%	10	100.0%	\$ 1,151,000	\$ 2,877,500	1.167	0.762	0.600	0.674	0.326	0.048	0.040	0.162	0.139	-1.464	0.800	1.000	0.933	0.067	0.200	0.100	-0.200	0.137	
444120 (Paint & Wallpaper Stores)	3	5	62.5%	3	100.0%	\$ 833,000	\$ 2,082,500	5	4	44.4%	4	80.0%	\$ 951,000	\$ 2,377,500	0.744	0.625	0.444	0.529	0.471	0.125	0.111	0.181	0.243	0.828	1.000	0.800	0.875	0.125	0.333	0.200	0.200	0.242	
444190 (Glass & Auto Glass)	11	7	38.9%	11	100.0%	\$ 3,380,000	\$ 8,450,000	21	16	43.2%	17	81.0%	\$ 6,198,000	\$ 15,495,000	-0.307	0.389	0.432	0.418	0.582	0.056	0.027	-0.044	0.142	1.547	1.000	0.810	0.875	0.125	0.091	0.048	0.190	0.123	
444210 (Outdoor Power Equipment Stores	3	2	40.0%	2	66.7%	\$ 3,425,000	\$ 8,562,500	7	3	30.0%	6	85.7%	\$ 1,181,000	\$ 2,952,500	0.387	0.400	0.300	0.333	0.667	0.200	0.100	0.100	0.258	-0.690	0.667	0.857	0.800	0.200	0.333	0.143	-0.190	0.276	
444220 (Nursery, Garden Center, Farm Sup	6	4	40.0%	6	100.0%	\$ 3,814,000	\$ 9,535,000	15	17	53.1%	14	93.3%	\$ 4,483,000	\$ 11,207,500	-0.725	0.400	0.531	0.500	0.500	0.100	0.031	-0.131	0.181	0.648	1.000	0.933	0.952	0.048	0.167	0.067	0.067	0.103	
812111 (Barber Shops)	23	19	45.2%	23	100.0%	\$ 1,333,000	\$ 3,332,500	32	10	23.8%	30	93.8%	\$ 1,758,000	\$ 4,395,000	2.065	0.452	0.238	0.345	0.655	0.024	0.024	0.214	0.104	1.221	1.000	0.938	0.964	0.036	0.043	0.031	0.063	0.051	
812112 (Beauty Salons)	81	74	47.7%	72	88.9%	\$ 7,778,000	\$ 19,445,000	125	58	31.7%	105	84.0%	\$ 15,256,000	\$ 38,140,000	3.013	0.477	0.317	0.391	0.609	0.006	0.005	0.160	0.053	0.985	0.889	0.840	0.859	0.141	0.012	0.008	0.049	0.050	
812113 (Nail Salons)	14	8	36.4%	14	100.0%	\$ 645,000	\$ 1,612,500	17	5	22.7%	17	100.0%	\$ 1,044,000	\$ 2,610,000	0.991	0.364	0.227	0.295	0.705	0.045	0.045	0.136	0.138	#DIV/0!	1.000	1.000	1.000	0.000	0.071	0.059	0.000	0.000	
812191 (Diet & Weight Reducing Centers)	5	7	58.3%	5	100.0%	\$ 3,080,000	\$ 7,700,000	3	6	66.7%	3	100.0%	\$ 595,000	\$ 1,487,500	-0.389	0.583	0.667	0.619	0.381	0.083	0.111	-0.083	0.214	#DIV/0!	1.000	1.000	1.000	0.000	0.200	0.333	0.000	0.000	
812199 (Other Personal Care Services, Exc	13	17	56.7%	12	92.3%	\$ 1,258,000	\$ 3,145,000	25	26	51.0%	20	80.0%	\$ 2,758,000	\$ 6,895,000	0.495	0.567	0.510	0.531	0.469	0.033	0.020	0.057	0.115	0.987	0.923	0.800	0.842	0.158	0.077	0.040	0.123	0.125	
812210 (Funeral Homes/Services)	9	8	47.1%	7	77.8%	\$ 2,672,000	\$ 6,680,000	23	16	41.0%	15	65.2%	\$ 5,524,000	\$ 13,810,000	0.419	0.471	0.410	0.429	0.571	0.059	0.026	0.060	0.144	0.689	0.778	0.652	0.688	0.313	0.111	0.043	0.126	0.182	
812921/922 (Photofinishing)	1	0	0.0%	1	100.0%	\$ 1,294,000	\$ 3,235,000	4	1	20.0%	4	100.0%	\$ 1,725,000	\$ 4,312,500	-0.490	0.000	0.200	0.167	0.833	1.000	0.200	-0.200	0.408	#DIV/0!	1.000	1.000	1.000	0.000	1.000	0.250	0.000	0.000	
812990 (All Other Personal Services)	3	13	81.3%	3	100.0%	\$ 538,000	\$ 1,345,000	6	6	50.0%	2	33.3%	\$ 58,000	\$ 145,000	1.752	0.813	0.500	0.679	0.321	0.063	0.083	0.313	0.178	1.897	1.000	0.333	0.556	0.444	0.333	0.167	0.667	0.351	
443142 (Electronics Stores)	22	40	64.5%	12	54.5%	\$ 3,807,000	\$ 9,517,500	24	38	61.3%	7	29.2%	\$ 1,816,000	\$ 4,540,000	0.372	0.645	0.613	0.629	0.371	0.016	0.016	0.032	0.087	1.746	0.545	0.292	0.413	0.587	0.045	0.042	0.254	0.145	
Totals: 26 NAICS Subsectors	351	371	51.4%	315	89.7%	\$ 97,578,000	\$ 243,945,000	511	429	45.6%	421	82.4%	\$ 77,641,000	\$ 194,102,500	2.324	0.514	0.456	0.481	0.519	0.001	0.001	0.057	0.025	3.004	0.897	0.824	0.854	0.146	0.003	0.002	0.074	0.024	
Restaurants:																																	
FF/pizza/takeout subtotal	113	37	24.7%	5	4.4%	\$ 868,000	\$ 2,170,000	157	27	14.7%	8	5.1%	\$ 1,540,000	\$ 3,850,000	2.308	0.247	0.147	0.192	0.808	0.007	0.005	0.100	0.043	-0.254	0.044	0.051	0.048	0.952	0.009	0.006	-0.007	0.026	
Other sit-down subtotal	85	64	43.0%	4	4.7%	\$ 879,000	\$ 2,197,500	117	43	26.9%	6	5.1%	\$ 1,167,000	\$ 2,917,500	2.968	0.430	0.269	0.346	0.654	0.007	0.006	0.161	0.054	-0.137	0.047	0.051	0.050	0.950	0.012	0.009	-0.004	0.031	
Restaurants total	198	101	33.8%	9	4.5%	\$ 1,747,000	\$ 4,367,500	274	70	20.3%	14	5.1%	\$ 2,707,000	\$ 6,767,500	3.845	0.338	0.203	0.266	0.734	0.003	0.003	0.134	0.035	-0.281	0.045	0.051	0.049	0.951	0.005	0.004	-0.006	0.020	
statistically significant at 95%																																	

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**Table S2: Summary of Economic Damages to Proposed Subclass,
by 6-Digit NAICS Code Subsector**

NAICS Subsector	Description	Firms, 2014/15 and 2018	Firms, 2014-15 But Not 2018	Reduction in gross sales, 4 years, assuming straight line	Surviving Firms, reduction in profit at sector average	Adjust. factor	Surviving Firms, reduction in profit (adjusted)	Business Interruption for closed firms	Adjust. factor	Business Interruption for closed firms (adjusted)
446120	Cosmetics, Beauty Supplies & Perfume Stores	19	9	\$ 81,230,000	\$ 4,244,268	1.00	\$ 4,244,268	\$ 1,570,327	0.75	\$ 1,177,745
446199	All Other Health & Personal Care Stores	9	10	\$ 12,695,000	\$ 622,055	1.00	\$ 622,055	\$ 1,744,808	1.00	\$ 1,744,808
524210	Insurance Agencies & Brokerages	90	100	\$ 32,882,500	\$ 4,759,742	1.00	\$ 4,759,742	\$ 17,448,081	0.75	\$ 13,086,061
524291	Claims Adjusting	4	4	\$ 622,500	\$ 74,856	0.75	\$ 56,142	\$ 697,923	0.75	\$ 523,442
524292	Third Party Administration—Insurance/Pension Funds	3	0	\$ 3,317,500	\$ 398,929	0.75	\$ 299,197	\$ -	0.00	\$ -
451120	Hobby, Toy & Game Stores	6	5	\$ 3,320,000	\$ 66,400	1.00	\$ 66,400	\$ 872,404	1.00	\$ 872,404
451130	Sewing, Needlework & Piece Goods Stores	1	1	\$ 3,072,500	\$ 61,450	1.00	\$ 61,450	\$ 174,481	1.00	\$ 174,481
451140	Musical Instrument & Supplies Stores	2	5	\$ 1,612,500	\$ 32,250	1.00	\$ 32,250	\$ 872,404	1.00	\$ 872,404
451211	Book Stores	9	9	\$ 6,002,500	\$ 3,001	1.00	\$ 3,001	\$ 1,570,327	0.75	\$ 1,177,745
711110	Theater Companies & Dinner Theaters	3	1	\$ 3,542,500	\$ 350,708	1.00	\$ 350,708	\$ 174,481	1.00	\$ 174,481
711190	Other Performing Arts Companies	5	7	\$ 5,800,000	\$ 574,200	1.00	\$ 574,200	\$ 1,221,366	1.00	\$ 1,221,366
711410	Agents & Managers For Public Figures	1	0	\$ 732,500	\$ 72,518	1.00	\$ 72,518	\$ -	0.00	\$ -
711510	Independent Artists, Writers & Performers	5	16	\$ 4,472,500	\$ 442,778	0.75	\$ 332,083	\$ 2,791,693	1.00	\$ 2,791,693
444120	Paint & Wallpaper Stores	3	5	\$ 2,082,500	\$ 76,011	1.00	\$ 76,011	\$ 872,404	1.00	\$ 872,404
444190	Other Building Material Dealers: Glass/Auto Glass	11	7	\$ 8,450,000	\$ 308,425	1.00	\$ 308,425	\$ 1,221,366	0.75	\$ 916,024
444210	Outdoor Power Equipment Stores	3	2	\$ 8,562,500	\$ 312,531	0.75	\$ 234,398	\$ 348,962	1.00	\$ 348,962
444220	Nursery, Garden Center & Farm Supply Stores	6	4	\$ 9,535,000	\$ 348,028	1.00	\$ 348,028	\$ 697,923	0.75	\$ 523,442
812111	Barber Shops	23	19	\$ 3,332,500	\$ 190,786	1.00	\$ 190,786	\$ 3,315,135	1.00	\$ 3,315,135
812112	Beauty Salons	81	74	\$ 19,395,000	\$ 1,503,113	1.00	\$ 1,503,113	\$ 12,911,580	1.00	\$ 12,911,580
812113	Nail Salons	14	8	\$ 1,612,500	\$ 92,316	1.00	\$ 92,316	\$ 1,395,846	1.00	\$ 1,395,846
812191	Diet & Weight Reducing Centers	5	7	\$ 7,700,000	\$ 619,850	1.00	\$ 619,850	\$ 1,221,366	0.75	\$ 916,024
812199	Other Personal Care Services [except Tattoo Parlors]	13	17	\$ 3,145,000	\$ 253,173	1.00	\$ 253,173	\$ 2,966,174	1.00	\$ 2,966,174
812210	Funeral Homes & Funeral Services	9	8	\$ 6,680,000	\$ 537,740	1.00	\$ 537,740	\$ 1,395,846	1.00	\$ 1,395,846
812921	Photofinishing Laboratories (Except One-Hour)	1	0	\$ 3,235,000	\$ 260,418	1.00	\$ 260,418	\$ -	0.75	\$ -
812990	All Other Personal Services	3	13	\$ 900,000	\$ 72,450	1.00	\$ 72,450	\$ 2,268,251	1.00	\$ 2,268,251
443142	Electronic Stores	22	40	\$ 9,517,500	\$ 449,702	1.00	\$ 449,702	\$ 6,979,232	1.00	\$ 6,979,232
	Subtotal, 26 Subsectors	351	371	\$ 243,450,000	\$ 16,727,694		\$ 16,420,420	\$ 64,732,380		\$ 58,625,552
722511	Full-Service Restaurants (fast food, pizza, takeout)	113	37	\$ 2,170,000	\$ 108,500	0.75	\$ 81,375	\$ 5,655,603	1.00	\$ 5,655,603
722511	Full-Service Restaurants (other sit-down, niche)	85	64	\$ 2,197,500	\$ 54,938	0.75	\$ 41,203	\$ 9,782,664	1.00	\$ 9,782,664
	Total	549	472	\$ 247,817,500	\$ 16,891,131		\$ 16,542,998	\$ 80,170,646		\$ 74,063,818
	TOTAL Reserve									\$ 90,606,816
	TOTAL BUSINESS LOSSES									\$ 9,060,682
										\$ 99,667,498

Exhibit 1:
ADDITIONAL DOCUMENTS REVIEWED FOR THIS CASE

Acosta, Roberto (2018). "Angelo's Coney Island closes after nearly 70 years in Flint," mlive.com, December 28, 2018; accessed at <https://www.mlive.com/news/flint/2018/12/angelos-coney-island-closes-after-nearly-60-years-in-flint.html>

Dempsey, Caitlin (2017). "How the 'Quirky Geography' of ZIP Codes Obscured Flint's Lead Problem," GIS Lounge, April 24, 2017; accessed at <https://www.gislounge.com/quirky-geography-zip-codes-obscured-flints-lead-problem/>

"Flint water crisis takes toll on city businesses," Fox 2 Detroit, January 18, 2016; accessed at <https://www.fox2detroit.com/news/flint-water-crisis-takes-toll-on-city-businesses>

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Simons, Robert A. (1992). "Site Attributes in Retail Leasing: An Analysis of a Fast Food Restaurant Market," *The Appraisal Journal*, October 1992, Vol. 60 Issue 4, 521-531.

Simons, Robert A., and John Brennan (1996). "Development and Issues of Inner-City Retail Niche Markets," peer-reviewed chapter in *Megatrends in Retail Property*, John Benjamin, ed., Boston: Kluwer, 1996 (sponsored by the American Real Estate Society and the International Council of Shopping Centers).

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Walters, Stefon (2019). "The Average Profit Margin for a Restaurant," azcentral, part of the USA Today network, August 22, 2019; accessed at <https://yourbusiness.azcentral.com/average-profit-margin-restaurant-13113.html>

Yakowicz, Will (2016). "What It's Like to Run a Business During Flint's Water Crisis," *Inc.*, January 22, 2016; accessed at <https://www.inc.com/will-yakowicz/flint-water-crisis-local-business-entrepreneurs.html>

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Exhibit 2:
EXAMPLES OF RESTAURANT EFFORTS TO REASSURE PATRONS

